

Unit 4

Day 6

Section 1.3

Dividing Polynomials

- Long Division and Synthetic Division

quotient  
divisor → 
$$\begin{array}{r} 56 \\ 15 \overline{)842} \\ \underline{75} \\ 92 \\ \underline{90} \\ 2 \end{array}$$
 dividend

$$15 \cdot 56 + 2 = 842$$

2

Therefore,  $842 \div 15$  is

$$56 + \frac{2}{15}$$

$$\text{quotient} + \frac{\text{remainder}}{\text{divisor}}$$

$$(\text{divisor})(\text{quotient}) + \text{remainder}$$

1)

Find the quotient when

$3x^3 + 4x^2 + x + 7$  is divided by  $x^2 + 1$ .

$$\begin{array}{r}
 3x + 4 \\
 x^2 + 1 \overline{) 3x^3 + 4x^2 + x + 7} \\
 \underline{+ (-3x^3 + 0x^2 + 3x)} \phantom{+ 7} \\
 4x^2 - 2x + 7 \\
 \underline{- (4x^2 + 0x + 4)} \\
 -2x + 3
 \end{array}$$

$$3x + 4 + \frac{-2x + 3}{x^2 + 1}$$

$$(3x + 4)(x^2 + 1) + -2x + 3$$

3)

(quotient)(divisor) + remainder = dividend

$$(3x+4)(x^2 + 1) + (-2x + 3)$$

4) Find the quotient when

$4x^5 - 3x^2 + x + 1$  is divided by  $2x^3 - 1$ .

$$\begin{array}{r} 2x^2 \\ 2x^3 \overline{) 4x^5 + 0x^4 + 0x^3 - 3x^2 + x + 1} \\ \underline{-4x^5} \phantom{+ 0x^4 + 0x^3 - 3x^2 + x + 1} \\ \phantom{0} \phantom{+ 0x^4 + 0x^3 - 3x^2 + x + 1} + 2x^2 \\ \phantom{0} \phantom{+ 0x^4 + 0x^3 - 3x^2 + x + 1} \underline{-x^2 + x + 1} \end{array}$$

$$2x^2 + \frac{-x^2 + x + 1}{2x^3 - 1}$$

$$(2x^2)(2x^3 - 1) + (-x^2 + x + 1) = 4x^5 - 3x^2 + x + 1$$

1)

coeff. 1  
Deg. 1

Use synthetic division to divide  $x^3 - 4x^2 + 5$  by  $x - 3$

opposite  
of constant  
divisor

coeff.  
quot.  
rem.

$$3 \overline{) 1 \quad -4 \quad 0 \quad 5}$$

$$3 \quad -3 \quad -9$$

$$\begin{array}{r} 1 \quad -1 \quad -3 \quad -4 \\ \hline x^2 - x - 3 + \frac{-4}{x-3} \end{array}$$

rem

coeff.  
of ~~divisor~~  
dividend

$$(x^2 - x - 3)(x - 3) + -4 = x^3 - 4x^2 + 5$$

2)

Use synthetic division to divide  $3x^3 + 4x^2 + x + 7$  by  $x + 1$

$$3x^3 + 4x^2 + x + 7$$

$$\begin{array}{l} x - K \\ x + 1 \end{array}$$

$$K = -1$$

$$\begin{array}{r|rrrr} -1 & 3 & 4 & 1 & 7 \\ & & -3 & -1 & 0 \\ \hline & 3 & 1 & 0 & 7 \end{array}$$

$$3x^2 + x + \frac{7}{x+1}$$

4)

Use synthetic division to divide

$$x^3 - 4x^2 - 5 \text{ by } x - 3$$

$$\begin{array}{r|rrrr} 3 & 1 & -4 & 0 & -5 \\ & & 3 & -3 & -9 \\ \hline & 1 & -1 & -3 & -14 \end{array}$$

$$x^2 - x - 3 + \frac{-14}{x-3}$$
$$(x^2 - x - 3)(x - 3) + -14 = x^3 - 4x^2 - 5$$



hmk:

Day 6 homework pg 35: 77-84 all  
pg 290: 5-12 all